RFDS 5.00: FIRE SPRINKLER SYSTEMS

5.1; UNDERGROUND

5.1.1; AUTOMATIC FIRE SPRINKLER SYSTEMS:

5.1.1.1; Design and Plans: Underground installation for NFPA 13 (or 13R) systems shall occur only in accordance with NFPA 24 and the civil plans approved by both the Redmond Water Utility and the Redmond Fire Marshal. Underground installation for NFPA 13 D systems shall occur only in accordance with a drawings approved by the Redmond Water Utility (to the meter) and the Redmond Fire Marshal (from main to floor flange at the riser. Design shall comply with all standard practice and design criteria established by the Redmond Water Utility and the following provisions. Plans shall include both plan and profile of the installation and identify specifics of all materials used.

5.1.1.1.1; For NFPA 13 D systems the underground pipe shall be a minimum of 1" I.D., high molecular polyethylene pipe or copper tube. The water meter shall be per Redmond Water Utility standards and the backflow prevention device shall be per Redmond Building Division plumbing code.

5.1.1.1.2; For NFPA 13 (or 13R) systems the underground pipe shall be a minimum of 4" ductile iron pipe.

5.1.1.1.3; Plan submittals for either NFPA 13 (13R)or 13D systems require hydraulic calculations for approval which verify the proposed sizing of pipe or tube used for underground f.d.c.s and supply.

5.1.1.2; Acceptance Testing: The installer shall perform all required acceptance tests (flush, purity, and pressure), complete the contractor's material and test certificate, and forward the certificate to the Redmond Fire Marshal's office prior to a request for final approval of the installation.

The installer shall give the Redmond Fire Department (556-2232) and (for NFPA 13 or 13R underground installations) the Engineering Inspection Division (556-2725) advance notification of the time and date of the testing. The Redmond Fire Department or the Engineering Inspection Division require a minimum of 48 hrs.(M-F) notice for witnessing the test.

5.1.2; UNDERGROUND FLUSHING REQUIREMENTS:

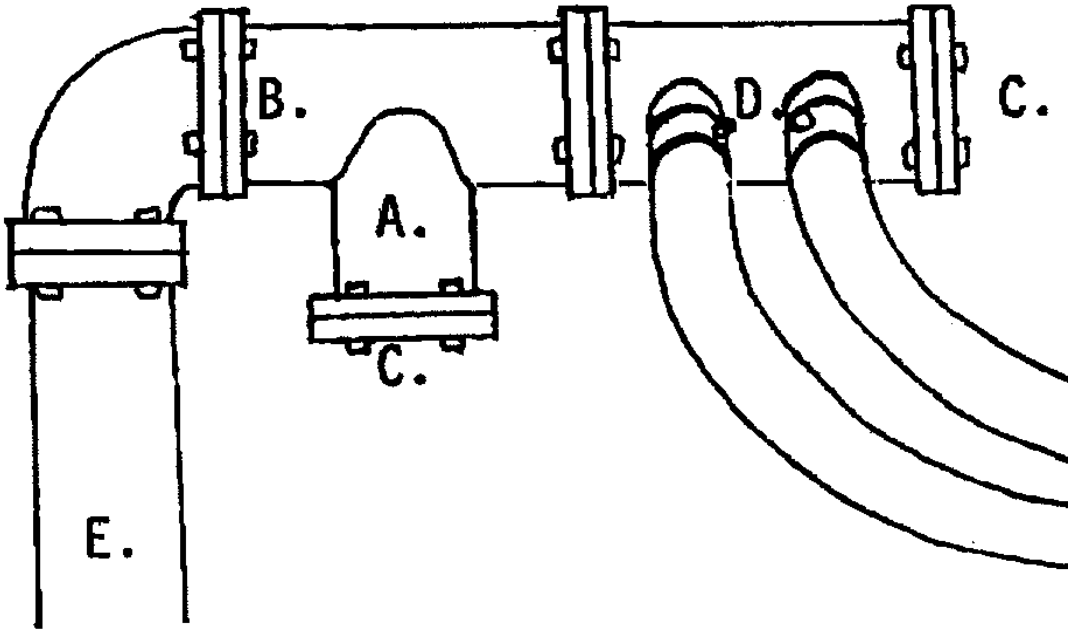
Underground mains and lead-in connections to system risers and F.D.C.s shall be flushed before connection is made to the above ground piping in order to remove foreign materials which may have entered the underground piping during installation. The flushing operation shall be per NFPA 13, 1994 ed. and NFPA 24, 1995 ed.. Redmond Water Utility or Construction inspectors shall witness such tests.

5.1.2.1; Provision shall be made for the safe disposal of flush test water in order to minimize possible property damage.

5.1.2.2; The following procedure is used for flush testing underground water supplies for fire protection systems. A minimum of two parallel sections of 2 1/2" diameter hose shall be used in conjunction with the rock trap flush test device. The flush test shall be run until the water is clear. The rock trap 'T' shall then be cleared. The system shall then be tested by bagging the ends of the hose with a clean burlap bag without holes. After full flowing for a minimum of 5 minutes the flow shall be stopped and the bag and trap examined. If the bag is free from holes and no rocks, scale, or other debris is found in the bag or trap then the system shall have passed the flush test. The city inspector need only witness the "bag" test and examine the trap and bag for approval.

5.1.2.2.1; Exception: NFPA 13 D systems shall be flush tested as per Redmond Water Utility standards for flushing of domestic lines. Rock Trap Flush Test Device: see illustration below.

Rock trap flush test device for connection to system riser or standpipe:



A. Rock trap "t".
B. Width of "t" and hose connection tube shall not be less than system piping width.
C. Removeable caps.
D. Minimum of 2, 2 /1/2" hose ports, each directly off tube. Arrangement may vary.
E. System width varies.

5.2; ABOVEGROUND

5.2.1; GENERAL:

5.2.1.1; All fire sprinkler systems shall meet the criteria as set forth in these standards and in NFPA 13, NFPA 13D, NFPA 13R (when allowed), NFPA 24, NFPA 231, 231c, 231d, & 231f as applicable.

5.2.1.2; The 1995 edition of NFPA pamphlets (or when no 1994 edition was published, the most recent edition of the pamphlet prior to 1995) shall be used, however the Fire Marshal reserves the right to use portions of later editions or T.I.A.s on a case by case basis, especially where the later version deals with newer technology.

5.2.1.3; The authority having jurisdiction for all new system installation or existing system modification, upgrade, equipment replacement, or repair work done within the City of Redmond shall be the Redmond Fire Marshal or his designees. The Fire Marshal shall be responsible for the interpretation and application of applicable standards to actual design and installation situations.

5.2.2; MONITORING:

5.2.2.1; All sprinkler systems having ten or more heads, other than in one and two family dwelling units shall be monitored by an approved central receiving station. Such monitoring shall be in place prior to occupancy and shall be continuous other than for limited times during maintenance, repair, or approved modification. Sprinkler systems in detached one and two family dwelling units are not required to be monitored.

5.2.2.2; Separate alarm zones are required for each sprinkler system zone, and/or each riser. One or more supervisory zones are required for tamper switches on all above ground control valves including the P.I.V.. Multiple tamper switches may be connected to a single supervisory zone, however when there are more than 12 switches the PIV(s) must be installed on a separate zone. Separate supervisory zones are required for each high/low air pressure switch (on dry systems). Separate alarm or supervisory zones are required for any additional zones for other fire systems which may be on site. System trouble signals shall be separate from all other zones

5.2.2.3; An audible alarm shall be provided by a mechanical water motor gong installed in an approved location. In situations where it is deemed impractical by the Fire Marshal for the installation of a water motor gong a 10" electric bell with battery back-up installed in an approved location may be substituted. The building itself shall be equipped with alarm signaling devices throughout. Audible devices shall be installed in accordance with RFD Standards and NFPA 72. Visual devices shall be installed in accordance with RFD Standards and applicable sections of WAC 51.

5.2.2.4; A fire alarm control panel is required for receiving all alarm and supervisory signals from a sprinkler system and processing them appropriately as called for in Redmond Fire Department Standards for fire alarm systems (RFDS 9.00). Transmission of signals to an approved central receiving station shall be in accordance with Redmond Fire Department Standards. Unless multiple buildings under the same ownership have a specific exemption in writing by the Fire Marshal each building shall have its own fire alarm control panel. Under no condition shall buildings under separate ownership share the use of a common control panel.

5.2.2.5; Proof of a valid contract(s) with a "**prime contractor**" for monitoring, maintenance, and emergency repair service are required prior to occupancy of the protected space. Thirty days written notice shall be given to the Redmond Fire Marshal prior to the discontinuation or transfer of the monitoring, maintenance, and/or emergency repair service contract(s).

5.2.3; PLANS AND PERMITS:

5.2.3.1; No pipe, fittings, or valves shall be installed at the subject site until a valid permit is obtained from the Redmond Fire Department and an approved set of plans and the permit are at the site except where an "over the counter permit" has been issued by the Fire Department. In this case a permit is still issued and must be displayed at the site, however, as-built plans must be created. These as-built plans must be received, reviewed, and approved by the Fire Department prior to scheduling a final inspection.

5.2.3.2; Submit a minimum of three copies of plans, specifications, calculations, and a completed permit application form to the Redmond Fire Department, City Hall Permit Center 15670 NE 85th St. . One set will be kept by the fire department. Allow a minimum of three weeks for the review and permitting process.

5.2.3.3; The drawings shall be on a uniform 24" x 36" size paper. Only scales of 1/4" or 1/8" to the foot shall be used.

5.2.3.4; All sets of plans and calculations submitted for review shall be stamped with a Washington State certificate seal, identifying the appropriate level of competency.

5.2.3.5; Information required on the plan submittal shall be as set forth in NFPA 13 Chapter 6 (1994 edition). Plans shall include all new and applicable existing underground and/or overhead piping beginning from the connection to the primary public water supply. Where new or modified underground is required it shall also be shown on a civil plan and approved by the Fire Marshal and the Redmond Water Utility. Tenant improvements or modifications shall include a building plan key showing where within the larger building the modifications are taking place. Plans submitted which do not contain all of the information called for are subject to rejection, delay, and/or denial of the permit.

5.2.3.6; All materials and components shall be U.L. listed or F.M.. 7. All fire alarm work, including the installation of the control panel shall follow the plan submittal requirements for fire alarm systems.

5.2.4; DESIGN STANDARDS, 1 & 2 DWELLING UNITS:

The following are design standards for the installation of sprinkler systems in one and two family dwellings and mobile homes.

5.2.4.1; All sprinkler systems in one and two family dwellings and mobile homes shall meet the criteria of NFPA 13D and the following criteria.

5.2.4.1.1; Sprinkler protection shall be required in all closets which exceed 10 square feet in area.

5.2.4.1.2; Sprinkler protection shall be required in entrance foyers.

5.2.4.1.3; All residential sprinkler systems shall pass a functional flow test witnessed by a representative of the Redmond Fire Department prior to acceptance of the system.

5.2.4.2; All piping, including the riser shall be maintained at 40 degrees F at all times unless a dry system is used. If a dry system is used then 40 degrees F shall be maintained at the riser and any other wet pipe.

5.2.5; DESIGN STANDARDS, COMMERCIAL STRUCTURES &/OR RESIDENTIAL WITH 3 OR MORE DWELLING UNITS :

The following are design standards for the installation of sprinkler systems in commercial structures and/or residential occupancies of three or more units per building. In some situations these criteria may be applied to one or two unit buildings at the discretion of the Fire Marshal if the structure is required to be sprinklered for grade or fire flow purposes and is within a development of buildings of three or more units and building-to-building continuity is desired (by the Fire Marshal).

5.2.5.1; Sprinkler systems meeting the criteria of NFPA 13R may be used as an alternate to a fire alarm system. This is the only accepted use of 13R systems currently in Redmond. All other sprinkler systems in commercial structures and/or residential occupancies of three or more units per building (except for some one or two unit buildings as defined in the paragraph above) shall meet the criteria of NFPA 13, 24, 231, and 231c,d,& f and the following criteria.

5.2.5.1.1; FIRE DEPARTMENT CONNECTIONS FOR SPRINKLER SYSTEMS:

5.2.5.1.1.1; All sprinkler systems (other than R-3, detached, one and two family dwellings) which have twenty or more heads shall be provided with a Fire Department Connection(s) (also known as an F.D.C.).

5.2.5.1.1.2; Fire Department Connections shall be located within 40' of a fire hydrant, and shall not be located on buildings. In all instances the location shall be approved by the Fire Marshal prior to beginning work. Normally the F.D.C. will be situated on the opposite side of the drive around a commercial building and in the same planter island as a hydrant.

5.2.5.1.1.3; F.D.C.s located in areas subject to vehicular damage shall be protected. Minimum protection for F.D.C.s which are 4' or greater from the center line of the F.D.C. to the driving surface shall be a minimum 6 inch curb. Where either 4' or 6" is not attainable guard posts per City of Redmond, and Redmond Fire Department Standards are required.

5.2.5.1.1.4; All F.D.C.s supplying sprinkler systems shall be painted red on the portion of the standpipe riser which is above ground except that the brass (or chrome) hose fittings shall remain unpainted. The fitting shall have the words "SPRINKLER" in raised letters on the top

5.2.5.1.1.5; All F.D.C.s supplying sprinkler systems must be clearly identified as to their function and the building or portion of a building which they serve. Identification shall be applied to the stem of the connection below the siamese and shall be permanent and weather resistant as specified below. Such signs shall be maintained by the building owner or his designee. Where deemed necessary by the Fire Marshal dividing lines between zones within a single structure shall be marked in an approved manner on the building in order to define areas of the building served by each fire system.

5.2.5.1.1.5.1; Identification shall be with a minimum 18 gauge metal sign.

5.2.5.1.1.5.2; The system design criteria shall be permanently etched into the sign in 1" letters as follows: "Sprinkler System, Pump at ____ P.S.I.." or "Combination System, Pump at ____ P.S.I."

5.2.5.1.1.6; All F.D.C.s shall be double clappered 2 1/2" NST, female, swivel couplings with breakaway metal caps

5.2.5.1.1.7; The minimum size of an F.D.C. shall be 4"x 2 1/2" x 2 1/2". Additional inlets may be required depending on the system demand.

5.2.5.1.2; ZONING:

5.2.5.1.2.1; In all sprinklered buildings two or more stories in height each story shall have separate control valves and flow switches. The determination of whether or not basements, attics or similar spaces require separate zoning will be determined on a case by case basis considering the relative area which is being supplied and starting with the assumption that a separate zone is required.

5.2.5.1.2.1.1; Exception:

R-1 occupancies up to and including 4 plexes, R-1 townhouse style buildings up to and including 6 units, and all other occupancies less than 10,000 square feet.

In multi-tenant, one story high bay office/warehouses with dropped ceilings, mezzanines, storage areas above offices, or second floor areas which create "first floor" areas the installer has the option of installing a first floor zone throughout the building or installing a first floor zone within each tenant space.

5.2.5.1.2.1.2; Exception:

Where an office/warehouse is prohibited by site plan review from ever having more than 20% additional square footage greater than the footprint, no separate floor zone is required, although area or horizontal separations may still require separate zones.

Where the option is exercised to provide a first floor zone within the space the first floor zone shall be provided with appropriate and accessible (< 6' A.F.F.) shut off valves, trim, and flow switches. It shall be required that the system designer demonstrate that such additions or tenant improvements do not compromise the hydraulic integrity of other spaces.

5.2.5.1.2.2; Where more than one riser is required by NFPA 13, section 4-2.1 each riser shall have separate control valves, water motor gong, trim, and flow switches.

5.2.5.1.2.3; Where multiple risers supply multi tenant buildings, systems shall be separated at tenant demising walls. If this tenant wall changes, the systems on either side must be expanded and reduced as needed, in accordance with the new zone division. This applies to a shell system and to tenant improvements such as referred to in 'b-2' above.

5.2.5.1.3; WALKWAYS:

5.2.5.1.3.1; Definitions for use in applying the installation standards of this section:

5.2.5.1.3.1.1; Enclosed or partially open - both sides of the walkway are closed to the exterior atmosphere between 3' and 8' A.F.F. or are open as much as but no more than 50% between 3' and 8' A.F.F..

5.2.5.1.3.1.2; Open - both sides of the walkway are open to the exterior atmosphere for greater than 50% between 3' and 8' A.F.F..

5.2.5.1.3.2; Installation Standards:

Where protection of covered walkways is required in the following section it shall be by an approved fire protection system (extinguishing, detection or both) similar to and compatible with the highest level of protection of the building or buildings to which it is attached or adjacent and in conformity with the listings of particular equipment or devices used. In determining the gross square footage of a building for fire protection requirements the gross square footage of the walkway shall be added to the gross square footage of the building(s) to which it is attached or adjacent (within 10 feet). Buildings and/or walkways shall be separated by a minimum clear area of 10 feet to be considered separate.

5.2.5.1.3.2.1; All enclosed or partially open walkways shall be protected throughout their length.

5.2.5.1.3.2.2; Open walkways shall be protected to a minimum of 14 feet from each building. Draft curtains of 1 hr. construction shall be installed across the full height and width of the roof cross section at the 14 foot point (unless sprinklered entirely).

5.2.5.1.4; VALVES:

5.2.5.1.4.1; Main system control valves and isolation valves:

5.2.5.1.4.1.1; All approved NFPA 13 systems shall have at least one yard valve per building for control of all automatic water supply to the sprinkler system. This valve shall be a Post Indicator Valve (or P.I.V.). This valve shall be located in a curbed, landscaped, area, a minimum of 15' and a maximum of 50' from the building. Where no curbed landscaping exists or for any other reason adequate protection against vehicular damage is not provided the Fire Marshal may require protective posts per City of Redmond standards to be installed. Where the minimum and/or maximum is not possible the P.I.V. shall be located as approved by the Fire Marshal.

5.2.5.1.4.1.2; The Fire Marshal may allow up to 5 supplies from a vault or riser room. Hydraulic calculations must verify all sizing. Where allowed additional isolation valves may be required in order to reduce the risk of all buildings having to be put out of service in order to work on one building. These may be street valves or post indicator valves as determined by the Fire Marshal.

5.2.5.1.4.1.3; Post indicator valves shall be installed so that the top of the operating nut is 36" to 44" above finish grade. The area within a 4' radius around the valve shall be clear of obstructions, have a compacted surface of crushed rock minimum, and have a cross slope of 5 % or less. Where there is an immediate drop of 6" or greater beyond the clear radius or where the slope away from the circle is greater than one foot drop in three feet or where in the opinion of the Fire Marshal there may exist a hazard to a firefighter

using the hydrant a protective guardrail shall be installed. The design for the guardrail shall be approved by the City prior to installation.

5.2.5.1.4.1.4; P.I.V.s shall be locked in the open position with a rotary shackle padlock or non-case hardened padlock. These shall be cut only by representatives of the Redmond Fire Department or the certified sprinkler maintenance company. Whoever cuts the lock shall replace it.

5.2.5.1.4.1.5; Where in the opinion of the Fire Marshal it is impractical to install a yard valve the Fire Marshal may require a wall indicator valve. Such a valve shall be located where there is a one hour rated wall a minimum of ten feet to each side of the valve and to the sky. There shall be no overhangs nor openings within this area except for one hour rated door assemblies which lead directly to the riser room. Wall indicator valves shall be located 36" to 50" A.F.F..

5.2.5.1.4.1.6; A minimum 24" wide access walkway of asphalt, concrete, pavers, stepping stones or similar approved material and design shall be provided to any yard indicator valve or isolation valve.

5.2.5.1.4.1.7; All approved systems with more than one zone shall have a main interior control valve.

5.2.5.1.4.1.8; All P.I.V.s shall be permanently labeled as to what they serve.

5.2.5.1.4.2; Check Valves:

5.2.5.1.4.2.1; All sprinkler systems shall have double detector check valves approved by the Washington State Department of Health.

5.2.5.1.4.2.2; All such valves shall be installed horizontally unless specifically approved and listed for vertical installation.

5.2.5.1.4.2.3; Double detector check valve assemblies may be located in a vault in the ground or within the riser room.

5.2.5.1.4.2.4; Check valves in F.D.C. lines shall be soft seat swing check valves. Water on the system side of such check valves shall be drainable through the main drain or an auxiliary drain. Water on the supply side shall drain at the low point through an automatic valve.

5.2.5.1.4.2.5; Isolation check valves shall be used in systems only when specifically approved and/or called for by the Fire Marshal. Such valves shall be conspicuously labeled.

5.2.5.1.4.3; Alarm Valves:

5.2.5.1.4.3.1; All sprinkler systems with more than one zone shall be provided with an alarm valve(s) and trim, including a water motor gong(s). Systems allowed to not install an alarm valve and water motor gong shall install a 10" electric bell/strobe with battery back up.

5.2.5.1.5; RISERS:

5.2.5.1.5.1; Riser Rooms:

5.2.5.1.5.1.1; Risers shall be located in a separate room from the general occupancy. Such room shall not be used for storage of any kind but may be used for electrical, telephone or fire alarm equipment in addition to sprinkler supply, valving, manifolds, trim, etc.. This room shall have direct exterior access to a location easily accessible by Fire Department personnel. The location shall be approved by the Fire Marshal prior to civil plan approval and sprinkler plan submittal. Indirect access may be allowed at the discretion of the Fire Marshal. Such access shall be conspicuously labeled.

5.2.5.1.5.1.2; Riser rooms shall be locked from the exterior. The locks shall be openable by either a Knox key, or master key, or code. If a master key or code are used a Knox key box shall be installed outside the door to the riser room preferably on the strike (handle) side of the door assembly.

5.2.5.1.5.1.3; Every building shall have at least one riser room. Where additional riser rooms are used each room shall indicate with a map(or maps) the area within the building which that riser covers and the location within the building of all other riser rooms.
5.2.5.1.5.1.4; The sprinkler riser or sprinkler valve rooms shall be labeled on the exterior side with a permanent sign. The letters shall be a minimum of 1" high and shall contrast with their background. Exterior signs shall be weather resistant. In some cases more than one door may be required to be marked in order to adequately identify the room location. Where the riser room is also the alarm panel room both designations shall be used.
5.2.5.1.5.1.5; Riser room construction shall consist of minimum 7' high demising walls on the interior side. Exterior and interior doors shall be 6'8" x 3'0" with lockable hardware. The Fire Marshal, may allow approved, heavy, 7 foot high, chain link fencing in warehouse type occupancies. Where the riser room is also the alarm panel room the room shall be fully enclosed.
5.2.5.1.5.1.6; At the direction of the Fire Marshal, riser room floors shall be striped and stenciled "no storage"
5.2.5.1.5.1.7; Sprinkler zone maps or diagrams shall be provided and maintained in the riser room.

5.2.5.1.6; SPECIAL SITUATIONS:

5.2.5.1.6.1; Concealed Spaces shall be protected as identified in NFPA 13 4-5.1.1 (1994 edition) and the following:

5.2.5.1.6.1.1; Combustible concealed spaces which are not provided with sprinkler protection by use of exception **No. 7** must meet the following criteria for an `isolated small room' . To be considered an `isolated small room' neither the room nor the concealed space above it shall exceed 55 square feet.
5.2.5.1.6.1.2; Fire retardent treated wood shall be considered as meeting the requirements of exception **No. 8**. Combustible concealed spaces which are not provided with sprinkler protection by use of exception **No. 8** shall be protected by an approved, supervised and monitored automatic heat detection system.
5.2.5.1.6.1.3; Concealed spaces which are not provided with sprinkler protection by use of exception **No. 9** shall be protected by an approved, supervised and monitored automatic heat detection system.

5.2.5.1.6.2; Spaces under Ground Floors, Exterior Docks, and Platforms (including crawl spaces) shall be protected as identified in NFPA 13 4-5.6 (1994 edition). Use of the exception listed under 4-5.6 shall be in accordance with the following:

5.2.5.1.6.2.1; In order to qualify for condition (a), openings for human access shall be limited to a lockable door no smaller than 30"x30" and no larger than 36"x36". The access is to be used only for building maintenance. A key for this door shall be labeled and provided for installation in the Knox key box. Maintenance personnel shall keep a key. Tenants shall not have access. Lattice or screening shall not allow the passage of a nominal 2" sphere in any location.
5.2.5.1.6.2.2; In order to qualify for condition (b), there shall be no electric wiring within the space unless it is within conduit or within a wall or chase constructed of 2" nominally thick material, covered by 5/8" type x sheetrock, or within a totally non combustible space.

5.2.5.1.6.2.3; Where spaces are not sprinklered by use of the exception under NFPA 13 4-5.6 the space shall be protected by an approved, supervised and monitored automatic heat detection system.

5.2.5.1.6.3; Elevator Hoistways and Machine Rooms shall be protected as identified in NFPA 13 4-5.5 (1994 edition). Use of the exception listed under 4-5.5.1 shall be in accordance with the following.

5.2.5.1.6.3.1; In order to qualify for the exception the hydraulic fluid must be non combustible. Working pressure and temperature must be taken into account in determining whether the fluid may be considered non combustible.

5.2.5.1.6.4; Exterior Roofs or Canopies (including awnings) shall be protected as identified in NFPA 13 4-5.7 (1994 edition). Use of the exception listed under 4-5.7 shall be in accordance with the following.

5.2.5.1.6.4.1; In order to qualify for the exception the entire construction of the canopy shall be non combustible and areas under the roof or canopy shall not be used for the storage or handling combustibles. Retail entrances, main exits/entries, loading exits/entries, areas potentially used for displays or similar situations shall not qualify.

5.2.5.1.7; ANTIFREEZE SYSTEMS:

5.2.5.1.7.1; Prohibition against the use of antifreeze

Antifreeze systems (both ethylene glycol and propylene glycol) shall be prohibited at this time. Concerns regarding runoff to streams or sewer systems and the availability of other systems has argued against allowing these systems at this time. The Fire Marshal shall have the prerogative to review, modify, or change this restriction at his discretion.

5.2.6; MAINTENANCE, INSPECTION, AND PERIODIC TESTING:

5.2.6.1; In general all sprinkler systems shall meet the criteria of NFPA 25 (1992 edition) and the following criteria:

5.2.6.1.1; Acceptance testing

5.2.6.1.1.1; All dry systems shall be flow tested from the inspectors test valve with a 1/2" orifice without a frame or deflector.

5.2.6.1.1.2; All dry systems regardless of size shall provide a continuous stream of water to the inspectors test valve within 60 seconds from the time it is opened.

5.2.6.1.2; Maintenance, inspection, and periodic testing.